TRAUMATISM OF THE SPLEEN

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THE literature of ruptured spleen was so very well reported by Willis in the July number of *Surgery, Gynæcology and Obstetrics*, that I will not take up your time with that part of the subject, but will confine myself to a few remarks based on three cases which I have treated during the past fourteen years.

No doubt most of you consider that rupture of the spleen is a rare condition, but I believe that it is more frequent than is generally supposed. It escapes diagnosis and this is my reason for wishing to draw your attention to the subject.

Abstracts of the case reports are as follows:

Case 1. Male, age forty-two. Family and previous history unimportant.

History of his present illness. He was riding on a lumber waggon when his team ran away, throwing him against one of the wheels on to the ground. He was dazed for half an hour or so. The pain was so intense that he went off the road to lie down, where he was picked up four hours later and taken to a ranch house. Although he had considerable pain, he did not think he was badly hurt. Eight hours after the accident he had become so white that his friends were alarmed and brought him to the hospital.

Condition on admission, twelve hours after injury: extreme pallor, moist, clammy skin, almost pulseless, respiration very shallow—practically entirely thoracic. Abdominal signs were those of an acute abdomen with a dull percussion note in left flank.

Diagnosis. Internal abdominal hæmorrhage.

Treatment was undertaken to combat shock, but while we were preparing to do blood transfusion, the patient died, forty minutes after admission.

As our experience showed later, this was clearly a case of death due to lack of early surgical care. The autopsy showed a large rupture of spleen with abdominal cavity full of blood.

Read before the Alberta Medical Association, September, 1919.

Case 2. Male, age twenty-four. Family and personal history unimportant.

History of his present illness. The patient was disinclined to answer questions, partly because he had been given considerable brandy as a stimulant and partly because he was not oversupplied with brains. We gathered from his employers on the ranch that he had been trying to catch a colt, which in some manner kicked him. He was half a mile away from the house at the time, but was able to walk home, undress himself and go to bed. He complained very much of pain in his left arm and shoulder and vomited two or three times during the afternoon. He did not sleep that night on account of pain in his shoulder and difficulty in breathing. The next morning he was very weak and had some pain in the abdomen which alarmed the mistress of the house, so they decided to bring him into town.

Condition on examination twenty-four hours after injury. Temperature 101°, pulse 132, respirations 28. Pulse very soft, skin pale and clammy. Chest shows marked dulness of lower half of left chest and absence of breath sounds up to the level of the fourth rib. Respirations very shallow. Complained very much of severe pain through upper part of left chest and left shoulder. Examination of the left shoulder showed there was no injury and that moving the arm did not affect the pain.

The abdomen was very rigid and tender all over. There was a marked dulness in the left flank and from umbilicus upward to gall bladder region. There was no nausea nor vomiting. The urine was very highly coloured, but outside of a few blood cells, was negative. Hæmoglobin, 75 per cent.; leucocytes, 14,000; reds, 3,500,000. The diagnosis was made of internal hæmorrhage from either spleen, liver or kidney, and we transfused 500 c.c. citrated blood.

Operation. Four hours later he was prepared for operation and anæsthetized with ether. We started with a small left rectus incision opposite the umbilicus. In opening the peritoneum we found free blood, so enlarged the incision upwards and across the middle line which gave us a good exposure of the source of bleeding in a large rupture in one end of the spleen. As the rupture in the spleen was oozing freely, we decided that we could do nothing to stop it, so tied off the pedicle with two double ligatures and removed the spleen. We placed a large cigarette drain through a stab wound of the left loin and after removing considerable blood, closed the abdomen. When he left the table, although his pulse was

rapid, 160 to 170, it was of better quality and his colour much better than it was when he entered the hospital. He was stimulated freely and given saline continuously for the first twenty-four hours. From this time on he made a steady recovery. On the third day, the drain was removed, but the drainage had been slight. His hæmoglobin on the tenth day was 80 per cent. When he left the hospital on the twentieth day it was 85 per cent. We believed that there was some pleural effusion which might have been blood, but as all physical signs had disappeared by the sixth day, we doubted whether much injury had been done to the lung. He was under observation for about three months, during which time his weakness gradually disappeared and he then returned to work.

Case 3. Female, age thirty-seven. Family history, negative. Personal history: married seven years, four children, all normal labours; no illnesses of interest.

History of present illness. About six years ago, while milking a cow, it tried to kick her, pushing her violently to the ground. When she got up, she had a sharp pain in her left loin and lower chest, and found it very difficult to breathe. As there were no signs of bruising, she did not think she was badly hurt. The next day she consulted her physician, who told her she had pleurisy. After about six weeks' treatment, she believed she was cured, as the pain and difficulty of breathing had disappeared, except that on a deep respiration she had pain in the upper part of chest and left shoulder. From that time until the present, she had had irregular attacks of pain in upper left abdomen, radiating to left shoulder. These attacks lasted two or three days, coming on at six or eight weeks' intervals. At the time of the attack she would notice she was very pale and that after the attack was over she would be very high coloured for about a week. She consulted a number of doctors during the period of six years and received different diagnoses. About two years ago one physician said she had tumor near the left kidney. Eight weeks before coming to the hospital, she was confined by a physician who knew nothing of her history. He discovered the tumor while palpating the abdomen, after the delivery. During the past two months the tumor has increased very much in size.

Present condition. Patient is a small emaciated woman with very sallow complexion and appears to have a very grave anæmia. Temperature for three days before operation was 90° to 100°, pulse 90 to 115, and respirations 20 to 24. She had two complaints only for which she sought relief, one is her inability to retain food for

more than fifteen or twenty minutes and the other a general weakness.

The examination of the heart and lungs is negative.

Examination of the abdomen in a standing position, shows her to have a large tumor which extends one and a half inches below the umbilicus, filling the whole upper abdomen. The whole area is very dull on percussion and the mass fixed in position. At the lower border of the tumor at the umbilicus, we thought we could make out a notch, although it was indefinite. When she was lying down the position of the tumor changed very little, only about one inch. No other abdominal organ, except some soft intestine, could be made out.

The stomach examination showed a deficiency of acid, but was otherwise negative. During the three days previous to operation, almost any food we gave her was vomited within one hour.

The urine showed specific gravity of 1010, was very pale and had considerable pus. Microscopic examination showed considerable blood, lots of pus, and a few casts. A total functional was done, which showed the two kidneys to be excreting 55 per cent. of normal. We did a cystoscopy which showed normal urine coming from right side, and the left side secreting urine with specific gravity 1002, and all the pathological elements of the total specimen. A differential functional showed the right kidney to be doing 90 per cent. of the total function.

The blood examination showed 3,250,000 red, 20,000 leucocytes, and hæmoglobin 80 per cent. The blood picture was otherwise normal.

The diagnosis further than abdominal tumor was not made, but a hydronephrosis of the left kidney was much favoured, although the spleen or the liver could not be eliminated from the diagnosis.

After three days of observation and preparation, she was anæsthetized with ether and a left rectus incision readily exposed a large tumor, which, after some exploration, was found to have a soft area at the left and upper side. The stomach and liver were out of reach, so we decided to aspirate with a gall bladder trochar, with the object of reducing the size of the tumour. We removed considerable fluid, but due to the force with which it came out through the trochar, some was lost. We were, however, able to collect nine and a half pints of fluid and debris, which was mostly old blood clot and fragments of broken down tissue. We then found that the collapsed wall of the tumor was part of the spleen, so we decided to do a splenectomy, which we did without much

difficulty as far as the pedicle of the spleen was concerned, but the separation of the wall of the tumor from the diaphragm and the anterior wall of the abdomen, gave us a great deal of difficulty. This left a very large oozing surface, which worried us for some time. The liver was about one quarter of the normal size, and was jammed high up in the right dome of the diaphragm. The common duct, pylorus and duodenum were displaced below and to the right. The stomach was greatly elongated and displaced to the right. The right kidney felt normal and the left kidney felt normal except that it was one half the size of a healthy one. We placed a heavy roll of gauze into the left dome of the diaphragm and out through a large stab wound of the left loin, our object being to control the oozing. When we started to suture up the abdomen, the picture was very much that of a post-mortem abdomen, with all the organs removed. Examination of the specimen showed that it was a large thick walled cyst of the spleen, which had evidently started by intra-capsular rupture, and had continued bleeding each time that the pressure was sufficiently relieved by the expansion of the capsule. The spleen and sac and contents we were able to measure, weighed eleven pounds, or, according to "Balfour's" recent paper, four times more than the largest spleen yet removed at the Mayo Clinic. The operation required about one and one-quarter hour's anæsthesia, and the patient left the table in only fair condition. After forty-eight very stormy hours, she started to improve, and on the fifth day had settled down toward a recovery.

When she went home on the twenty-third day, the function of stomach, intestine and kidney was almost normal. When we heard from her about a year later, she had gained fifteen pounds and was feeling well.

From a study of these cases and some of the small amount of the literature on the subject, we would say that the condition might be very well divided into two classes according to the pathological findings, that is whether the rupture is intracapsular or through the capsule, but I believe it is of more value to divide them into two classes as we clinically find them.

First. Where the body has received a very crushing injury and the patient dies within a very short time from shock and hæmorrhage.

Second. Where the spleen is ruptured from a slight injury which may leave no mark on the body.

The cause of rupture of the normal spleen, under the second clinical division is very hard to explain, and only one solution has

been offered, that the spleen is very movable and when the body receives a blow it is the sudden recoil of the spleen against the ribs, which causes it to rupture.

In the chronic hypertrophic spleen, rupture is induced by the slightest violence, such as a light blow over the splenic area, or even turning in bed.

The diagnosis must be based upon: (1) the history of injury; (2) on a definite interval before the patient realizes that he is seriously ill. This does not apply to rupture of an hypertrophied spleen, in which the hæmorrhage is immediately profuse and rapidly fatal. (3) On the referred character of the pain, which is generally to the left chest and shoulder; (4) difficulty in breathing; (5) signs of internal hæmorrhage, cold white skin, soft rapid pulse and subnormal temperature in the first six hours; (6) rigidity of the abdomen; (7) an increasing area of dulness in the left upper quadrant of the abdomen and the left flank. There may be vomiting, but generally there is no nausea.

A differential diagnosis would have to be made between perforated gastric or duodenal ulcer, ruptured kidney, hæmo-thorax, and mesenteric embolus.

Perforated ulcer of the stomach or duodenum, is ushered in by very sudden, severe abdominal pain, acute vomiting and nausea, and signs of intense shock, whereas in a ruptured spleen there is frequently severe pain referred to the left shoulder and upper arm and the signs of shock or hæmorrhage develop slowly. This pain in the shoulder is considered to be a reflex from irritation of the phrenic nerve supplying the diaphragm referred along the other sensory nerves originating in the third and fourth cervical segments of the spinal cord. In ruptured kidney, the dulness is confined to the loin and the abdominal tenderness is rarely marked. The pain is generally referred down the ureter to the groin. The urine contains blood and the patient complains of colic due to the passage of blood clot.

In hæmothorax the abdomen may be rigid, but is usually "resistant" on the affected side. The heart may be displaced and the constitutional signs of hæmorrhage are not so well marked. There is greater difficulty in breathing and there may be pronounced cyanosis.

In mesenteric embolus, the sudden acute abdominal pain is generally at the umbilicus with vomiting, nausea, signs of shock, without those of hæmorrhage, followed early by marked tympanites, and intestinal obstruction. In many cases it may be impossible to

make an exact diagnosis. The history of violence, however slight. and the signs of internal abdominal hæmorrhage warrant immediate exploratory incision.

Treatment. The treatment of ruptured spleen can only be considered as surgical inasmuch as spontaneous cessation of bleeding is not to be expected.

From our experience with these three cases we believe the first and most important part of treatment is early diagnosis of internal abdominal hæmorrhage; then, if necessary, an immediate blood transfusion to obtain temporary improvement. The technique of the citrate method is so very simple it should be available in every small hospital, and the blood group of possible donors should be on record.

As soon as the effect of the transfusion is apparent, the patient should be anæsthetized and the abdomen opened through a left trans-rectus incision.

The source of bleeding being found in the spleen the incision is extended to the costal margin, and for greater freedom of access an oblique incision may be made from the vertical incision outward and upward.

Removal of the spleen is the only certain method of controlling the hæmorrhage. In selected cases of small clean cut rupture of the capsule not extending to any great depth, suture gives good results. Linked mattress sutures of plain gut should be employed.

It is inadvisable, however, to spend time in suturing when the patient shows undoubted effects of blood loss.

Removal of a previously healthy spleen presents but two difficulties: ligature of the pedicle and separation of the tail of the pancreas. It is important that the pancreas be not injured as escape of its secretions may jeopardize the success of the operation. Delivery of the spleen through the incision on to the abdominal wall can usually be done with ease. This manœuvre facilitates the separation of the tail of the pancreas from the pedicle, as the parts are in full view. A short vertical incision through the peritoneum allows the pancreas to be stripped from the pedicle by gauze pressure.

The pedicle is clamped, then ligatured en masse. Individual veins may require ligature and finally the splenic artery should be isolated and tied proximal to the mass ligature. The gastro-splenic omemtum containing the vasa brevia of the stomach requires clamping and tying off and this should be done as close to the spleen as is possible.

Blood clot and fluid blood should be removed from the cavity and the incision closed without drainage. It is of advantage to fill the abdomen with normal saline at a temperature of 115° F.

Prognosis. The prognosis will wholly depend upon the time which elapses from the receipt of injury to that of operation.

When the operation can be performed in the first twelve hours after the injury, in reasonably good surgical surroundings, the mortality should not be greater than that of an early acute appendix.

The patient's previous condition as regards heart and kidney, will very greatly affect the prognosis on account of their importance in the recovery from the loss of blood.

Conclusions. First—Ruptured spleen can only be treated as a surgical condition of the abdomen.

Second—Although the severe symptoms may be delayed, we should more often think of this condition in examining patients with histories of slight injury to the lower left thoracic region.

Third—Pain in the left shoulder when no injury can be found about the joint, should at least be considered as being referred from the spleen.

Fourth—Splenectomy is not a difficult operation, and should be undertaken by any man who has reasonable operating facilities.

Fifth—Ruptured spleen should always be considered as a condition demanding early treatment rather than postponed treatment at some large centre.

THE Honourable Justice Hodgins has reported to the government on the result of his investigations as commissioner on the mentally defective of Ontario. In his report he sums up the situation by stating that the unwatched mental defective is the cause of great crime production, and the province has never yet done its duty towards him. He strongly advocates the elimination of these unfortunates from the school and the street, a process which would, he affirms, empty the jails of half their inmates.